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Philosophical Transactions

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IV. *An Abstract of the Rev. Mr. Gould's Account of English Ants ; in a Letter from the Rev. Henry Miles, D.D. and F.R.S. to Mr. Henry Baker, F.R.S.*

Read Jan. 15. 1746-7. **I** HERE send you a short Abstract of an ingenious Treatise on *English Ants*, the Perusal of which has entertained and instructed me not a little ; and as the very industrious Author has made more Observations than any other Person amongst us appears to have done, and has discover'd several curious Particulars not mention'd by other Writers on the Subject, I thought you would not be displeased to see a brief Account of the Performance, with a few Remarks and Emendations I have taken the Liberty to make.

The Book is intituled, “ *An Account of English Ants;*” which contains, 1. Their different Species and Mechanism ; 2. Their Manner of Government, and a Description of their several Queens : 3. The Production of their Eggs, and Process of the Young : 4. The incessant Labours of the Workers, or common Ants ; with many other Curiosities observable in these surprising Insects : By the Rev. *Wm. Gould, A. M. of Exeter-College, Oxon.* London : Printed for *A. Millar*, opposite *Katherine-Street* in the *Strand*, MDCCXLVII. in large 12mo.

CHAP. I. Contains a Description of Ants in general, their various Sorts, Colour, and Structure of their Parts.

Five Species of Ants have occurred to the Observation of our Author. 1. The Hill Ant, vulgarly called the Horse-Ant. 2. The Jet Ant. 3. The red Ant. 4. The common yellow Ant. 5. The small black Ant.

Having described the Size and Colour of these, he proceeds to describe the Structure and nice Mechanism of Ants with great Accuracy; observing, that, besides the *Viscera*, there is in the Body of Ants a Bag of corroding spirituous Liquor, which they can eject to a considerable Distance at Pleasure. This Particular has also been observed by other Writers.

He says, he has met with a Ligament in the red Ant, which uniteth the Breast and Body, consisting of two Lobes somewhat round; but in other Ants there appears but one Lobe, which rises higher, and is broader, than the Lobes in the red. It is this Species of red Ants, which he has observed to have a Sting, of the same Contexture with that of a Bee, in Miniature: In other Ants he has met with no Sting; but they bite, or make a small Incision, with their Saws, ejecting some of the afore-mention'd corroding Liquor, &c. The red Ants, which are furnished with a Sting, he observes live more open, &c. and are more bold than any of the others; and therefore such a Weapon is servicable to them.

The Jet-Ants, he informs us, have a peculiar disagreeable Smell, which he imagines may be a great Preservative to them against an Enemy; — and that the Spirit which all Ants eject is very strong, affecting at a small Distance in the same manner as Spirits of Hartshorn.

CHAP. II. Treats of their Colonies, Cells, &c.

Here our Author observes, that tho' they unite in Colonies, in such Places and Situations as are most agreeable to their different Natures, &c. yet their Residence is not so limited as to admit no Variation; however 'tis worth observing, that the several Species never so intermix, as to associate and breed together, tho' they will live near and good Neighbours one to another.

Their Architecture, he says, is adjusted with remarkable Curiosity and Art, the whole Structure being divided into a Number and Variety of Cells, communicating all of them with one another by little subterraneous Channels, which are circular and smooth; but as for the Incrustation, most *Virtuosi* have mention'd, in the Apartments of Ants, our ingenious Author observes, that after the most careful Observation he could never find any Composition in their Structures; the Cells being formed in the Mold itself, without any Addition of Glew, Straws, &c. He acknowledges it may be otherwise in hotter Climates, where Sand is more apt to crumble.

Their Works, as he informs us, are all carried on by the Assistance of their double Saws, and the Hooks which are placed at the Extremity of them, described by him in the preceding Chapter. The Process and Manner of their Work may easily be observed, he says, if you deposit some Ants, with a Lump of moist Earth under a Glass.

CHAP. III. Treats of their Government; describes their several Queens; the Respect shewn them by the common Ants, &c.

A Colony, our Author tells us, from the latter End of *August* to the Beginning of *June*, is usually composed of a large Female, and various Companies of Workers. — And besides these, in the latter End of *June*, all *July*, and Part of *August*, of a Number of winged Ants commonly known by the Name of Ant-Flies. The Government, he says, has been universally taken for a Republic or Commonwealth; and have been treated as a Body consisting of Males and Females; the former being looked upon to be those which make their Appearance with Wings in the Summer. But as, in the Oeconomy of Bees, the Generality of them have no Distinction of Sex, but make it their whole Employment to provide for the Young laid them by their Queen, so the same Character is found to be maintained in the Constitution of Ants. The common Ants therefore, which usually present themselves to our View, are, he says, like the common Bees, of neither Sex, but seem intirely destined to take care of, and educate the Young, which the Queen deposits in the Cells.

In every perfect Colony, our Author says, there is at least one Queen; who, in the Space of 7 or 8 Months, gives Birth to a Family, amounting, at a moderate Computation, to 4 or 5000; except the red Queens, who are not so prolific. The yellow Ants being the most frequent, he gives a very particular and curious Description of their Queen; which, he tells us, is perhaps 5 times larger than any of her Subjects; and that, moreover, in her Front she has three Eyes, in a triangular Form, which are less than the two common ones on each Side her Head. I omit other Particulars, as also his Description of the other
Queens,

Queens, for Brevity's sake. --- The Queen of the Jets, he says, he never had the Pleasure of seeing.

He has beautifully represented the Obedience and Respect the Queen commands, in whatever Apartment she condescends to be present, --- An universal Gladness, he says, spreads itself thro' the whole Cell, expressed by particular Acts of Joy and Exultation: They have a particular Way, it seems, of skipping, leaping, and standing upon their hind Legs, and prancing with the others; which Frolicks they make use of both to congratulate each other when they meet, and to shew their Regard for the Queen. Some walk gently over her, others dance around her, and all endeavour to exert their Loyalty and Affection. However romantic, says our Author, this Description may seem, it may easily be proved, by placing a Queen, with her Retinue, under a Glass; for, in a few Moments, you will be convinced of the Honour they pay, and Esteem they have for her.

In *October*, he tells us, Ants and their Queens begin to retire downwards; and, in the Depth of Winter, are to be found in the remotest Apartments, incircled close with a Cluster of Attendants, and, as it were, benumb'd.

CHAP. IV. The Author gives a particular Account of the Time and Manner in which the Queens lay the Eggs, &c.

And he says, he has been the more circumstantial in this Point, to remove a Mistake of Sir *Edmond King's*, who, not aware of there being a superior Female, gave into the old Opinion, that
the

the small Ants were the Females, and supplied the Colony with Young: After a just Description of the Sperm or Eggs, Sir *Edmond* observes, that he found that Substance among the common Ants; and that he gave the more Credit to that Opinion, because of the great Care and Tenderneſs with which they treat it.---- But our Author does not allow this Reason to be concluſive, inasmuch as the ſame is to be met with in the Constitution of Bees; adding, That having at all Times of the Year obſerved the common Ants, he could never diſcern any Alteration in their Bodies but what was occaſion'd by Food, or ſome Accident.

The Queen, he ſays, lays three different Sorts of Eggs, Male, Female, and Neutral: The two firſt in the Spring; the laſt in *July*, and Part of *August*.

CHAP. V. Our Author treats of the Change of the Eggs to Vermicles, &c. and gives us an Account of their ſurpriſing Continuance in that State.

The Queen having furniſhed the Eggs, he ſays, the common Ants brood over them in little Cluſters, perhaps by way of Incubation; and remove them to different Parts of the Colony, for the better Advantage of Moiſture, and a juſt Degree of Heat and Cold. The Time of Continuance in the Egg-State is ſomewhat uncertain: But he ſays they ſeem to diſengage themſelves from the Membranes that incloſe the Eggs in the ſame Manner as Silk-worms do.

The Proceſs of Ant-Vermicles, he tells us, is remarkable, and worth Obſervation. The Female Eggs put on the Form of Worms ſome time in *February*, at fartheſt; the Male by the latter End of *March*;

March; the Neutral by *September*. The first Summer they grow very sparingly; the succeeding Winter they seem at a Stand: In the Beginning of *April* of the second Year they visibly augment every Day; and in six Weeks, or by the End of *May*, the Male and Female attain their greatest Proportions, and are ready for another Change. This long Continuance of Ants in a vermicular State he thinks a great Curiosity, hardly to be met with in any other Class of Insects---the Female Ant continuing above a Year and Quarter, the Workers a Twelvemonth, the Males somewhat more.

CHAP. VI. Treats of a Transmutation of Ant-Vermicles to Nymphs or *Aurelia's*, &c.

The Vermicles, he says, weave in the Manner of Silkworms, and in a few Days infold themselves in a soft filken kind of Tissue: They henceforth assume, and, whilst confined in this Monument, continue the Character of *Aurelia's*. These are the small Bodies which abound in the Settlements in the Summer-Months, and are vulgarly reputed Ant-Eggs; but their Largeness, and visible Transmutation (as he justly observes), shew the Mistake.

Our Author takes notice of a remarkable Variation in the *Aurelia's* of the red Ants. When the Worms arrive at their Period of Transmutation, he says, they do not infold themselves in a Tissue or Shell, like the others, but lie motionless, and, to outward Appearance, insensible; in a few Days look whiter than ordinary, and in this manner gradually put on the Form of Ants. Thus Providence (remarks our Author) is tied down
to

to no particular Laws; but can, by a surprising Variety, accomplish the same Ends.

In the VIIth Chap. he proceeds to treat of the Transformation of the several *Aurelia's* to Flies and common Ants, with a Description of their Structure, Duration, and other Curiosities relating to the Change. But the just Progress of Ants-Eggs, Vermicles, Nymphs, &c. cannot, he says, be precisely stated; because they will not arrive at Maturity under Glasses, as *Swammerdam*, before him, had observed.

As soon as the Ant-Nymphs, surrounded with a Tissue, are tending to Life, he says, the Workers give them Air, by an Aperture in the Head-Part of the Covering; which Aperture they gradually enlarge; and, after a Day or two, take out the Young, and expose it to the freer Access of the Sun-beams, which are of great Force in promoting its Maturity.

Our Author observes, that Philosophers have usually confounded the two different Sorts of Ant-Flies, the large and small, looking upon them all under the Character of Males; tho' there be so wide and manifest a Variance in the Colour, Size, &c. that the naked Eye may easily distinguish it. — On the contrary, therefore, he presumes they are of different Sexes: The small ones he takes to be Males, and the large Females; and thinks it highly probable, that some of these Females, afterwards, give Birth to new Colonies, and intitle themselves to the Dignity of Queens; there being, as he says, many strong Experimental Reasons to support so uncommon a Curiosity; which he also recites, and answers the chief Objection against it, taken from the Number of these Ant-Flies: The principal Thing of which his Answer consists

consists is, that the most obvious Use of them is for the Sustenance of other Animals.

In the Close of this Chapter he annexes a few remarkable Curiosities resulting from the Change. --- The casting of their Wings is an Instance, he says, peculiar to the large Ant-Flies; these being to other Insects their highest Decorations; and the Want of them lessens their Beauty, and shortens their Lives. On the reverse, a large Ant-Fly gains by the Loss, and is afterwards promoted to a Throne, and drops those external Ornaments, as Emblems of too much Levity for a Sovereign.

CHAP. VIII. Our Author here treats of the incessant Labours of the Workers, the true Method of collecting their Provisions, and inquires into the Truth of the Opinion of laying up Corn, &c. against Winter, &c.

He says, The general Subject of this Chapter has been so largely treated of, and well illustrated, by some of the happiest Favourites of *Minerva* and *Apollo*, that it is impossible to set it off with more Beauty of Thought, or Elegance of Stile; but perhaps, (says he) in many Circumstances they have rather shewn the Poet than the Philosopher; and rather indulged an extensive Fancy, than Strictness of Inquiry.

I must here omit the Account the Author gives of the Labour and Industry of the common Ants, which is certainly very curious, that I may avoid being tedious; observing only, in general, that the Feeding the Young is the most laborious Exercise be-

longing to the working Ants, and a Part of their Industry the most uninterrupted of any.

The Juices of most Sorts of Fruit, Insects, and Honey, or any other delicious Liquid, he says, are the Repast which they nurture them with. These Juices they extract, and first convey into their own *Alvus*, and afterwards infuse into the Bodies of the Vermicles; which Aliment, he supposes, may probably undergo some Refinement in the Repositories of the Ants, and, being there meliorated, is properly tempered for the delicate Structure of the Worms.

It has been a Dispute, says our Author, amongst the Inquisitive on this Subject, whether Ants have Magazines of Corn, and lay up a Stock of Provisions against Winter. The Generality of Writers, he says, hold the Affirmative; referring, in his Margin, to *Solomon, Pliny, Virgil, Horace, Aldrovand, Swammerdam, &c.* Here I am obliged to do Justice to *Swammerdam*; who, in his *Biblia Naturæ*, expressly says, that he never at any time observed them to get together any Food against Winter; and is of Opinion, that, during the Severity of the Winter, they eat nothing; as is common with many Insects, and some Species of Bees. His own Words, in *Vol. I. p. 296.* are as follow: *Neque etiam unquam observavi, quod cibaria quædam in hyemem sibi comparent: unde censeo ipsas, quousque vehementissima est hyems, nihil comedere; quemadmodum multis insectis, et apum quoque nonnullis speciebus, familiare est; quæ tempore brumali ab omni penitus cibo abstinent.*

Our Author, with great Deference to the Writers who have held the Affirmative, and with extreme Decency, differs from them, offering a handsome
Apology

Apology for himself. --- He suggests, that in warmer Regions they may not undergo the Chill they do with us ; and therefore may not pass the Winter in a State of Numbness. --- That, if this be the Case, a Store of Food must be necessary to them, which is not to our Northern Ants, which live, as it were, entranced. He adds, that, upon the most impartial Examination of Authors, the Opinion seems rather to be supported by its Antiquity, than reduced to a clear Demonstration. --- He tells us, that, as upon the most exact and frequent Examination of numerous Settlements, in the Winter, he could never trace out any Reservoirs of Corn, or other Aliment ; no, not in those of the Hill-Ants, which are the largest, and proportionably strong : So, to put this Matter beyond all reasonable Doubt, he had recourse to Experiments ; which, had the Supposition been true, could not probably fail of succeeding. At the Beginning of the Spring, he placed, in several Flower pots, and other Conveniencies, different Colonies of yellow small black Ants, &c. with their respective Queens, Attendants, and Vermicles ; in which Position they continued Summer, Autumn, and Winter, and carried on their Operations as in other Settlements, nourished their Young, and brought them to Perfection : From whence he concludes, that they would have laid up Provisions, had it been their Custom ; but, upon carefully examining some of these Pots, he found no Appearance of Magazines of Corn, or any collected Food : And that, upon his having frequently observed their Excursions from, and Return to their Colonies, he could never find, that they ever return'd with any Wheat, Corn, or any other

vegetable Seed; tho' they would with Eagerness attack a Pot of Honey, or a Jar of Sweetmeats, &c. Many other Experiments, besides these, our Author made, which I forbear to give you, judging these to be satisfactory.

The most material Argument in Favour of Ant-Magazines, he thinks, is the Authority of the Sacred Writings.----*Solomon*, he says, has twice mention'd these extraordinary Insects; and each time with an immediate Reference to their Sagacity in providing for the Necessities of Winter. — For removing this Difficulty, he has recourse to the former Solution.— The superior Warmth of the Climate he lived in, and, of consequence, the proportionable Clemency of the Seasons; whence he concludes the Ants of those Countries may vary from ours in this, as well as in other Respects: Or perhaps, adds he, it might have been a received Opinion, as was the Sun's Motion; from whence this great Prince might recommend it, as a worthy Example of Industry and Wisdom.

If I might have Leave humbly to offer my Opinion, our Author seems to have justified his Conduct in departing from the commonly received Opinion: And perhaps there is good Reason to think that it has been handed down from ancient Writers of Reputation, and too easily received, without carefully examining into the Truth of the Fact; which Persons might easily be led to do from a general Observation of the extraordinary Industry of these little laborious Animals in carrying Things into their Cells.

The most learned *Bochart*, in his *Hierozoicon*, has display'd his vast Reading on this Subject, as he usually

usually does on all others; and has cited Passages from *Pliny*, *Lucian*, *Ælian*, *Zoroaster*, *Origen*, *Basil*, and *Epiphanius*, *Jewish Rabbi's*, and *Arabians*, all concurring in the Opinion, that Ants cut off the Heads of Grain, to prevent their germinating: But he confesses, that the ancients *Greek Writers* have made no such Observation of the Ants; nor any of them who lived before *Pliny*, as far as he remembers. Very probably this Opinion arose from what might have been observed of these laborious Insects, in cutting asunder with their Saws such Grains of Corn, or other Matters, which they might have Occasion to carry to their Nests, but were too bulky; for that they cut off Grass, and other Things, which they find in the Road to and from their Repositories, our Author has observed: And it is observable, that the *Hebrew* Name of the Ant that *Nemala*, from the Verb נמל, *Namal*, which signifies to cut off, is used for cutting off Ears of Corn (*Job*, xxiv. ver. 24.*)

But if we consider the two Texts, in the Book of *Proverbs*, cited by our Author, there is not the least Intimation in them of their laying up Corn in Store *against Winter*. In *chap. vi. ver. 8.* it is said, *She provideth her meat in the summer, and gathereth her food in the harvest*: For, tho' the former Verb הכין *Hekin* signifies to prepare, or dispose in Order, and the latter אגר, *Agar* to collect, or gather together;

* I might also have referred to the *Theatrum universale omnium Animalium* of *Jonston*, publish'd by Dr. *Ruych* junior of *Amsterdam*, in 2 Volumes *folio*, Vol. II. p. 85.

together ; and in the only two Places where I find it occur besides, is used for Gathering in Summer, as *Prov.* x. 5. and for Gathering in the Vintage, *Deut.* xxviii. 39. yet the Expressions, in the Text, necessarily mean no more, than that they collect their Food in its proper Season ; — nor is there any thing else declared *chap.* xxx. *ver.* 25. So that all which may fairly be concluded from Scripture is, that they carry Food for themselves into their Repositories *. That they do this against *Winter* can only be determined by examining into the Fact : This our Author has done with very great Diligence, and has discovered, with respect to our *English* Ants, that they eat not at all in the Winter and have no Stores laid in of any sort of Food. The Opinion therefore of their laying in Magazines against Winter, seems to me to have been grafted on these Scriptures, rather than found in them ; and this from a Conclusion naturally enough made, from observing (as I said) their wonderful Labour and Industry in gathering their Food in the Summer, — supposing that this must be to provide against Winter. — And, after all, great Part of their Labour, which may have been bestowed in other Services, might easily be mistaken, by less accurate Observers, for carrying in Food.

I am sorry I must omit the ingenious Author's just moral Reflections ; but my Time will only allow me to conclude, as he does, with the Words of the Royal Psalmist, *Great is the Lord, and marvellous,*
worthy

* *i. e.* To serve them as long as it will keep good, or they shall need it.

worthy to be praised, and there is no End of his Greatness. I am,

Dear Sir,

Tooting, Dec. 10.
1746.

Your most affectionate,

and obliged humble Servant,

H. Miles.

V. *A Remark on Father Hardouin's Amendment of a Passage in Pliny's Natural History, Lib. II. § LXXIV. Edit. Paris. folio, 1723. by Martin Folkes, Esquire, Pr. R. S.*

Read Jan. 22.
1746-7.

*V*Asaque horoscopa non ubique eadem sunt usui, in trecentis stadiis, aut ut longissime, in quingentis, mutantibus semet umbris solis. Itaque umbilici (quem gnomonem appellant) umbra in Ægypto meridiano tempore, æquinoctii die, paulo plusquam dimidiam gnomonis mensuram efficit. In urbe Roma nona pars gnomonis deest umbræ. In oppido Ancone superest quinta. Decima in parte Italiæ, quæ Venetia appellatur, eisdem horis umbra gnomoni par fit.

The geographical Reader cannot but observe here immediately, that somewhat is faulty in this Passage as it stands; since the equinoctial Shadow of the *Gnomon* being made shorter at *Ancona* than at *Rome*, the Latitude of *Ancona* will consequently be made lesser than that of *Rome*; whereas it is known to be